Fermilab

Particle Physics Division
Mechanical Department Engineering Note

Number: MD-ENG-094 Date: 12-12-05

Project Internal Reference: None.

Project: Portable Air Compressor Engineering Note

Title: FESHM 5031 Engineering Note

Author(s): Dave Pushka

Reviewer(s):Bob Wands

Key Words: Engineering note, silver sticker, pressure vessel

Abstract Summary: Engineering note for a code stamped pressure vessel used as an air receiver on a portable electrically powered air compressor assigned to the Mechanical Department Detector Installation group.

Applicable Codes: ASME Section VIII Division 1

PRESSURE VESSEL ENGINERING NOTE

PER CHAPTER 5031

Prepared by: Dave Pushka
Preparation date: 08 December 2005

1. Description and Identification
Fill in the label information below:

This vessel conforms to Fermilab ES&H Manual Chapter 5031

Vessel Title: EMGLO Portable air compressor

Vessel Number PPD - 10098 ←Obtain from Division/Section Safety Officer

Vessel Drawing Number: No drawing (commercial tank)

Maximum Allowable Working Pressures (MAWP):
Internal Pressure 240 psig
External Pressure One atmosphere, 0 psig

Working Temperature Range: -20 °F, 200 °F

Contents: Compressed Air

Designer/Manufacturer
LEISS MFG. INC.

Test Pressure (if tested at Fermi) Acceptance Date:
Not tested at Fermilab ←Document per Chapter 5034 of the Fermilab ES&H Manual

n/a PSIG, Hydraulic _____ Pneumatic _____
Accepted as conforming to standard by

_____

of Division/Section _____ Date: _____ ←Actual signature required

NOTE: Any subsequent changes in contents, pressures, temperatures, valving, etc., which affect the safety of this vessel shall require another review.

Reviewed by: Rlt LL cats Bob Wands Date: 12/9/05

Director's signature (or designee) if the vessel is for manned areas but doesn't conform to the requirements of the chapter.

_____ Date: _____

Amendment No.: Reviewed by: Date:

_____ _____ _____

Lab Property Number(s):No Property Code Assigned _____
Lab Location Code: Lab E & F or where needed _____(obtain from safety officer)
Purpose of Vessel(s): Air Receiver for a portable air compressor _____
Vessel Capacity/Size: 15 gallons _ Diameter: 11 ½ inch _ Length: 33 inches
Normal Operating Pressure (OP) 125 psig ____
MAWP-OP = 115 _____PSI
List the numbers of all pertinent drawings and the location of the originals.

Drawing #	Location of Original
None	Not applicable

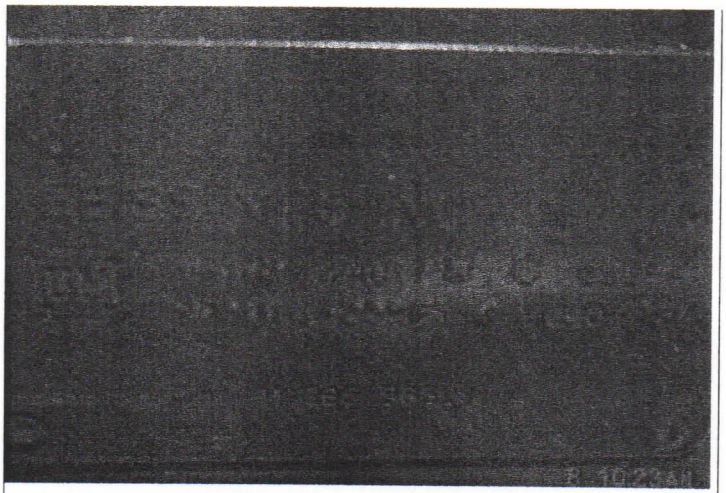
2. Design Verification

Is this vessel designed and built to meet the Code or "In-House Built" requirements?
Yes__X__ No_____.

If "No" state the standard that was used _____.
Demonstrate that design calculations of that standard have been made and that other requirements of that standard have been satisfied.
Skip to part 3 "system venting verification."

Does the vessel(s) have a U stamp? Yes__X__ No_____. If "Yes", complete section 2A; if "No", complete section 2B.

A. Staple photo of U stamp plate below.
Copy "U" label details to the side



Copy data here:

Certified by
LEISS MFG INC

UM MAWP 240 psi @ 550 F

MDMT -20 F @ 240 psi

SN 141 2005

CRN H1765 56521

014

Provide ASME design calculations in an appendix. On the sketch below, circle all applicable sections of the ASME code per Section VIII, Division I. (Only for non-coded vessels)

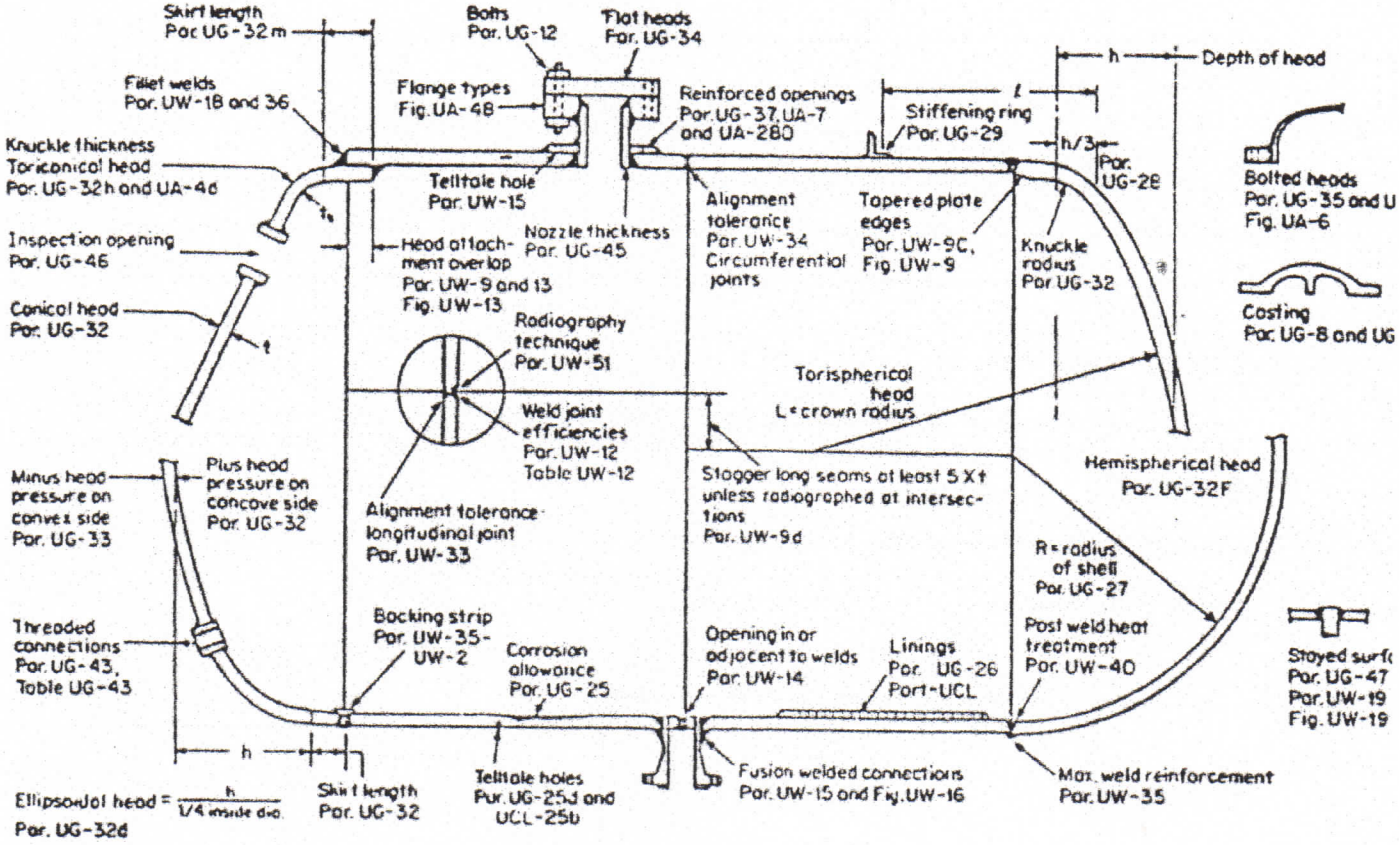


Figure 1. ASME Code: Applicable Sections

2B.

Summary of ASME Code

Item	Reference ASME Code Section	CALCULATION RESULT (Required thickness or stress level vs. actual thickness calculated stress level)
_____	_____	_____ vs _____
_____	_____	_____ vs _____
_____	_____	_____ vs _____
_____	_____	_____ vs _____
_____	_____	_____ vs _____

3. System Venting Verification Provide the vent system schematic.

Does the venting system follow the Code UG-125 through UG-137?
Yes_X_ No___

Does the venting system also follow the Compressed Gas Association Standards S-1.1 and S-1.3?
Yes __X__ No_____

A "no" response to both of the two proceeding questions requires a justification and statement regarding what standards were applied to verify system venting is adequate.

List of reliefs and settings:

Manufacturer	Model #	Set Pressure	Flow Rate	Size
CDI of St. Louis MO	ST 25	200 PSIG	178 SCFM	¼ inch MNPT

4. Operating Procedure

Is an operating procedure necessary for the safe operation of this vessel?
Yes_____ No__X__ (If "Yes", it must be appended)

5. Welding Information

Has the vessel been fabricated in a non-code shop? Yes_____ No__X__
If "Yes", append a copy of the welding shop statement of welder qualification (Procedure Qualification Record, PQR) which references the Welding Procedure Specification (WPS) used to weld this vessel.

6. Existing, Used and Unmanned Area Vessels

Is this vessel or any part thereof in the above categories?
Yes_____ No__X__

If "Yes", follow the requirements for an Extended Engineering Note for Existing, Used and Unmanned Area Vessels.

7. Exceptional Vessels

Is this vessel or any part thereof in the above category?
Yes_____ No__X__

If "Yes", follow the requirements for an Extended Engineering Note for Exceptional Vessels.

THIS VESSEL CONFORMS TO FERMILAB ES&H MANUAL CHAPTER 5031

Vessel Title: Portable Air Compressor Air Receiver

Vessel Number_____

Vessel Drawing Number: Not applicable as this is a purchased commercial air receiver

Maximum Allowable Working Pressures (MAWP):

Internal Pressure: 240 psi at 550 F

External Pressure: One atmosphere (0 psig)

Working Temperature Range -20 ^{0}F to 550 ^{0}F

Contents: Compressed Air

Designer: LEISS Manufacturing Inc.

Test Pressure (if tested at Fermi) Not tested at FNAL DATE __/__/____

____ _____PSIG, Hydraulic _____Pneumatic _____

Accepted as conforming to standard by

_____

Of Division/Section _____

NOTE: Any subsequent changes in content, pressures, temperatures, valving, etc., which affect the safety of this vessel shall require another review and test.

Figure 2. Sample of sticker to be completed and be placed on vessel.

RELIEF VALVE SIZING CRITERIA:

Compressor is an EMGLO Pump model LU. The currently produced version of this pump is a Model G pump according to a representative of EMGLO. Displacement of the model LU and model G pumps is 13.8 cfm.

The compressor is fitted with a General Air Products (1-800-345-8207) Model 69MC8LY pressure switch. This switch includes an unloader valve. The unloader valve stops the compressor intake valves from opening at 125 psig (pump continues to rotate but no air is compressed – this is to limit the on-off cycling of the compressor motor). The pressure switch shuts off the motor at 150 psig. The relief valve is set at 200 psig and the maximum allowable working pressure of the air receiver is 240 psig.

The compressor is the sole source of pressure for the receiver. The vessel if used indoors is in areas with fire protection, so a fire condition is not a credible source of pressure. Therefore, the relief valve capacity is only dependent on the compressor displacement.

The compressor displacement is 13.8 cfm. The relief valve capacity is 178 cfm at 220 psig (110% of the set pressure). Therefore, the relief valve capacity exceeds the compressor capacity and this meets the ASME requirements.

Relief valve was purchased new in December 2005 and installed at that time. The relief valve will need to be re-tested or replaced in 2011. Cost of the Relief valve was $6.38 from Granger.